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**Analysis of OSHA's Data Underlying  
the Proposed Ergonomics Standard  
And Possible Alternatives  
Discussed by the SBREFA Panel  
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## I. INTRODUCTION

### A. BACKGROUND

The Occupational Safety and Health Administration (OSHA) plans to propose an Ergonomics (Ergo) regulation, the objective of which is to reduce or eliminate specific types of work place injuries, called musculoskeletal disorders (MSDs). The Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), requires OSHA to consider the economic impact of the rule on small businesses. This report, prepared by Policy Planning & Evaluation, Inc. (PP&E) on behalf of the Office of Advocacy, Small Business Administration (SBA), examines OSHA's evaluation of the impact of the standard on small entities and its estimates of the number of MSDs that will be reduced when the standard is implemented.

MSD injuries include strains, sprains and tears, back pain, soreness and hurt back, carpal tunnel syndrome, hernia, and connective tissue diseases and disorders caused by<sup>1</sup>:

- overexertion,
- repetitive motion, or
- bodily reaction (such as bending, climbing, or crawling)

OSHA's draft ergonomics standard consists of two parts -- the Basic program and the Full program. Entities in the manufacturing sector and those in which manual handling operations exist must implement the Basic (Phase I) program within one (1) year of the promulgation of the rule and a Phase II program when an MSD occurs. All other entities (except those in the exempted agriculture, maritime and construction industries) must implement the Full program (Phase I and Phase II) when and if an MSD occurs or if a known hazard already exists.<sup>2</sup>

This report, and the analysis contained therein is based on information provided by OSHA to the SBREFA Panel and only on that information contained in OSHA's "Preliminary Initial

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<sup>1</sup> Such injuries not only occur due to overexertion, repetitive motion and bodily reaction, but also due to other causes; however, such accidental injuries are not classified as MSDs. Similarly, overexertion, repetitive motion and bodily reaction cause other types of injuries; but only those injuries listed which are caused by overexertion, repetitive motion, and bodily reaction are classified as MSDs.

<sup>2</sup> Phase I of the draft standard consists of Management Leadership and Employee Participation (in setting up the program) and Hazard Identification and Information (dissemination). Phase II of the program consists of Job Hazard Analysis and Hazard Control, Training, Medical Management, and Program Evaluation.

Regulatory Flexibility Analysis”. In that analysis, OSHA examined several alternatives to the proposed rule<sup>3</sup>; however, the analysis did not:

- calculate and compare the costs and benefits of the alternatives
- present a sensitivity analysis of the costs and benefits of its assumptions based on establishment size
- present and discuss readily available background information which helps to identify differences between different categories of businesses, including differences between high-hazard and low-hazard businesses
- present information on the differential impacts of the rule on small businesses in different size categories
- give adequate consideration to low injury incidence rates in almost 3/4 of the small businesses in the manufacturing industry
- give adequate consideration to the high level of hazard present in some industries and in 1/4 of the manufacturing establishments.

In order to perform a complete economic assessment of the potential impact of this draft standard it is necessary to include this level of analysis. Finally, one important factor should be taken into account. Namely, that a small business is not simply a large business with fewer employees. Many factors affect how a standard may impact a small business much differently than it affects a large business. For example, small businesses generally experience a much higher turnover rate than larger businesses. Thus, any standard requiring the training of employees (such as the proposed Ergo standard) is likely to impose a disproportionate burden upon small businesses as compared to large businesses. Such differential impacts should be taken into account when drafting any standard.

This report, despite the limitations of time and resources, addresses some of the same regulatory flexibility issues that OSHA has addressed, and indicates where OSHA's analysis may be deficient. It articulates the issues and points out why regulatory flexibility should be provided to small businesses.

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<sup>3</sup> These alternatives include: 1) no rule: rely on existing OSHA programs and rules; 2) no basic program requirement for manufacturing and manual handling; 3) basic program required for all general industry; 4) signs and symptoms as a trigger for the full program; 5) a job hazard analysis as a trigger for the program; 6) no medical removal protection; 7) cover manufacturing operations only; 8) cover manufacturing and manual handling operations only; 9) exempt small businesses in general industry; and, 10) exempt low hazard firms.

PP&E's examination is partly based on the background documents provided by OSHA.<sup>4</sup> In order to accurately assess the adequacy of OSHA's regulatory flexibility analysis, PP&E gathered additional data from several public sources including the Bureau of Labor Statistics (BLS) and the National Institute for Occupational Safety and Health (NIOSH). The injury and illness information available from the BLS was particularly helpful in analyzing the effectiveness of OSHA's draft standard because it identified industries and SIC codes in which small businesses usually experience very few or no injuries and are candidates for regulatory flexibility. Much of the analysis presented in this report has been constructed by using the basic information compiled by the Bureau of Labor Statistics. This information was also used to articulate the costs and benefits of the Ergo rule for specific segments of small businesses.

## **B. ORGANIZATION OF THE REPORT**

This report is divided into three major sections. Chapter II addresses the national costs of the regulation. It first presents OSHA's purported costs of the regulation by duplicating the agency's methodology. Then, it shows how total costs are likely to change under different assumptions. Chapter III assesses five major alternatives to the proposed regulation based on the frequency of MSD injuries in certain jobs and in certain industries. Chapter IV assesses regulatory alternatives based on the costs and benefits facing low-risk and high-risk firms. Three appendices to this report provide OSHA's cost and benefit methodologies as well as alternative methodologies.

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<sup>4</sup> OSHA documents reviewed for this report include: (1) Draft Ergonomics Rule (including Appendix A and Summary); (2) Preliminary Initial Regulatory Flexibility Analysis (PIRFA); (2) Summary of Preliminary Risk Assessment and Significance of Risk Analysis; (3) Summary of the Rule's Estimated Impacts and Benefits on a Small Business in Your Industry; and, (4) Preliminary Estimates of the Economic Impacts, Costs, and Benefits of the Proposed Rule as a Whole.

## **II. TOTAL COST OF THE PROPOSED RULE**

The cost of the Ergo standard (to a firm) depends on the characteristics of individual program elements and on how they may be implemented. The Basic program consists of two elements: (1) management leadership and employee participation and (2) hazard identification and information. The cost of the Basic program depends on the amount of time the management of a company might take to develop a program, that is, to understand the rule's requirements, to review existing injury and illness records, to identify hazards, to train employees in recognizing ergonomic hazards, to establish procedures for reporting, and to assign authority and responsibility for monitoring the program. The cost of the Basic program to a firm also depends on the size of the company, number of employees that need to be trained, the extent of risk presented by different jobs, and the number of jobs that present MSD hazards to employees.

The Full program consists of the Basic (Phase I) program plus the Phase II program which contains four major elements: (1) job hazard analysis and control; (2) medical management; (3) training; and, (4) program evaluation. Each of these elements contains factors which impact the total cost of the Ergo program to an employer.

The first element of the Phase II program, job hazard analysis and control, involves analyzing the problem job (one in which an MSD has occurred) and hazards in similar jobs. Information on OSHA's web site suggests that companies may have to video tape the work in progress to understand and analyze the sequence of steps in doing problem jobs. It also involves the development and implementation of interim and permanent controls to minimize or eliminate hazards. The costs of this part of the program will depend on the cost of all of the modifications that may have to be made to the plant machinery.

The second element, medical management, contains a medical removal provision where the injured worker will have to be compensated for all wages and benefits lost due to an MSD for up to 6 months. Thus, the cost will depend on the length of the period during which a worker stays away from work and the degree to which he is covered by worker's compensation or other programs.

The training element not only consists of ensuring that a worker does his job properly, but of making him aware of the signs and symptoms of MSDs, the importance of reporting, the

procedures for reporting, and job-specific controls and work practices that have been implemented. Managers must also receive proper training on the ergonomics program and their role in it, ways to identify and analyze WMSD hazards, ways to identify, evaluate and implement control measures, and evaluate the effectiveness of the program. Thus, the training costs will depend on the number of employees that need to be trained as well as on the breadth and depth of the required training.

Finally, the program evaluation element is an on-going part of the Ergo program. A company must monitor its program to determine whether or not it is effective. For this purpose, it must select Activity and Outcome effectiveness measures, establish baseline measurements, establish priorities for controlling hazards, and use the effectiveness measures to evaluate the program and the controls. This element also involves responding promptly to identified or reported MSDs. Thus, its costs depend on the extent to which MSDs continue to occur.

## **A. OSHA's COST ESTIMATES**

The national cost of the proposed Ergo rule (calculated by using OSHA's reports and data and by replicating their methodology) is \$2.82 billion for large and small businesses (see Table 1)<sup>5</sup>. Equipment changes to control Ergo hazards account for \$1.55 billion (or 55%) of the \$2.82 billion total cost. The cost of medical removal protection accounts for \$670 million (or about 24%) of the total cost. According to OSHA, the Basic Program (Phase I) will cost \$628 million (or about 22%) of the total cost of the proposed standard. As shown in the third column, the cost of these three elements is driven by the number of MSDs (647,344), the cost of making equipment changes (\$2,400 per MSD), the cost of Medical Removal Protection (\$1036 per MSD), the number of establishments affected by the Basic programs (2.72 million), the number of employees affected (40.8 million), and the managerial and employee time it would take to set-up and implement the program. A major portion of this chapter is devoted to an examination of the effect that alternative values of various inputs have on the total costs of the rule.

## **B. POTENTIAL COSTS OF THE RULE**

### **1. Validity of the Overall Approach**

OSHA's cost estimates are based on several key assumptions. One of these assumptions is that

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<sup>5</sup> OSHA estimated that the cost of the Ergo program will be \$3.5 billion. However, based on the available information, this figure cannot be replicated. See Appendix D for the replication of OSHA's methodology.



**Table 1. Estimated Costs of the Ergonomics Program  
Based on OSHA's Methodology**

<b>Program Element</b>	<b>Estimated Cost<sup>6</sup> (\$millions)</b>	<b>Primary Cost Criterion (In Addition to Personnel Time)</b>
<b>Basic Program (Phase I)</b>		
Managerial Training	132.80	# of affected estab. = 2,720, 000
Initial Program Set Up	66.42	# of affected estab. = 2,720, 000
Reporting System Set Up	66.42	# of affected estab. = 2,720, 000
Reporting of MSDs	6.53	# of MSDs = 647,344
Employee Information	358.18	# of affected estab. = 2,720,000 # of employees =40,800,000
<b>The Phase II Program</b>		
Management Training	63.23	# of MSDs = 647,344
Job Analysis	26.12	# of MSDs = 647,344
Hazard Control Program	90.85	# of MSDs = 647,344
Hazard Control – Equipment Change etc.	1,553. 62	# of MSDs = 647,344 , Cost of Control Per MSD = \$2,400
Employee Training	41.93	# of MSDs = 647,344
Administering Med. Management	15.81	# of MSDs = 647,344
Medical Removal Protection	<u>670.65</u>	# of MSDs = 647,344 and cost of Protection per MSD = \$1036
<b>Total Cost</b>	<b>2,824.42</b>	

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<sup>6</sup> The cost per establishment is provided in Table A-1.

the "average" firm employs about 15 people (the average size appears to have been calculated by dividing the total employment in the private industry by the total number of establishments).<sup>7</sup> Thus, the estimates of the total cost of the entire rule are valid only to the extent that the characteristics of this average firm are valid for calculating the cost of the total population of firms.

There are many indications that reliance on the "average" establishment when estimating costs has several limitations that need to be considered. For example, OSHA assumes that for each MSD only 3 employees are affected and that only \$800/ affected employee needs to be spent to control hazards. This means that even in an establishment in which a large number of similar jobs exist, only 3 employees will be affected if only one MSD occurs every year. In a firm such as the United Parcel Service, hundreds of persons may have to be trained and hundreds of pieces of equipment may have to be modified as a result of the occurrence of a single MSD. In a national firm, with numerous facilities, the changes might be made at all facilities rather than at one or two problem facilities. Thus, total costs based on an "average" firm and an average MSD are likely to be incorrect.

## **2. Number and Types of Injuries Covered**

**(1). A Different Count Based on BLS data:** OSHA calculated the cost of the rule by assuming that 647,344 MSDs occur every year; however, the source of this estimate is not provided in OSHA's "Preliminary Initial Regulatory Flexibility Analysis". PP&E constructed this figure from the 1996 BLS data on injuries and illnesses after consultation with both BLS and OSHA. The results of the reconstruction are presented in Table 2. It is apparent that OSHA estimated the number of MSDs by using the data on injuries and illnesses with days away from work.

One can reasonably hypothesize that injuries with "days away from work" probably constitute the vast majority of MSDs; however, Table 3 provides the context within which total number of MSDs must be viewed and suggests that additional injuries and illnesses may be claimed as MSDs. Table 3 shows that:

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<sup>7</sup> It has been quite difficult to address the shortcomings of the entire methodology, because OSHA either has not stated its assumptions at all or has provided very little explanation for their assumptions in the PIRFA. For example, the methodology does not state that the costs have been estimated by assuming that the average firm has only 15 employees. Only during the SBREFA panel process, did OSHA reveal this fact.

- A total of 1,880,525 injuries and illnesses resulted in days away from work. Of this total, 647,344, or about 34%, have been classified as MSDs by OSHA. Some of the remaining injuries and illnesses will likely be treated as MSDs by taking advantage of the Medical Removal Protection clause of the proposed rule (Medical Removal Protection comes into play once there is a medical determination that the injury is an MSD requiring absence from work).<sup>8</sup>
- Private industry experienced a total of 2,832,500 injuries and illnesses with lost work, of which 1,880,525 resulted in days away from work. This means that 951,975 resulted in some impairment of job activity or performance but did not result in the employee being away from work entirely. In such cases, injured workers continued to work and did not claim any workers' compensation payment (because they did not stay away from work). Depending on the type of injuries, these cases or a large portion of them could be claimed to be reportable MSDs under the draft rule. It is reasonable to assume that 34% (or 323,671)<sup>9</sup> of these non-lost-work-day injuries will be claimed as MSDs under the proposed regulation. Based on this assumption, the number of MSDs will increase from 647,344 to 971,015 or by about 50%.
- There were 3,406,400 injury and illness cases in which there was no work lost and employees did not stay home as a result of an injury (see Table 3). Therefore, this group consists of workers who suffered an injury, but whose work may or may not be impaired as a result. Thus, depending on the type of injuries suffered, a portion of these may also be claimed as MSDs. If we assume a more conservative estimate, such as 20% (or 681,280), of such injuries and illnesses are claimed as MSDs, the MSD count increases substantially.

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<sup>8</sup> For instance, as shown in Table 2, about 400,000 (1,040,045 – 647,344) injuries and illnesses consist of sprains, strains and tears, back pain, hurt back, Soreness, pain, hurt, except back, carpal tunnel syndrome, hernia, and musculoskeletal system disorders (the first part of the definition of an MSD), but they were not caused by Overexertion, Repetitive Motion and Bending Climbing, etc. They were "accidental" and caused by events such as falling, etc.. They cannot be classified as MSDs under the draft rule; however, some of the overexertion injuries may well be caused by accidental sudden use of force in a job. Therefore, until "accidental" injuries are properly defined, some of these 400,000 injuries and illnesses could be claimed to be MSDs.

<sup>9</sup> The 34% estimate is based on the fact that 34% of all injuries with days away from work are MSDs, and, thus, it seems reasonable to assume that 34% of all injuries **without** days away from work will also be MSDs.

Hence, under the ERGO program, the number of MSD cases could go up from 647,344 per year to 1,653,195 ((971,015 + 681,280), or an increase of about \$1.0 million) depending on what constitutes an MSD. This implies that an additional 1 million cases involving MSDs might be reported in the future. Furthermore, if a significant portion of the "accidental" injuries (about 400,000) also becomes classified as MSDs, the MSDs count could easily triple the current estimate. *This means the cost of the Ergo program, under OSHA's own cost estimating methodology, would increase from \$2.82 billion to about \$8.46 billion without changing the value of any other input.*<sup>10</sup>

**(2) Other Factors Affecting the MSD Count:** The total number of MSDs will also depend upon the classification of injuries and illnesses as MSDs by physicians or other health care providers. The causal relationship between work-related factors and an injury is not straight forward and clear. According to NIOSH, only certain work related factors have strong evidence of causal relationships (See Table 4). Work-related factors other than the primary factors might induce one to claim an injury to be an MSD. For example, an MSD-like back injury may occur when a worker maintains an awkward posture, or when he has a static work posture (sitting in one position) or when his whole body vibrates. These factors are different from overexertion, repetitive motion, and bending, climbing, crawling, etc., the criteria specified by OSHA's draft Ergo standard for determining whether an injury constitutes an MSD. However, as shown in Table 4, such factors are present in many instances involving shoulder, neck, wrist, elbow and back injuries. It is not clear how such factors should or should not be taken into account in determining whether an injury qualifies as an MSD. In the absence of proper guidance and clarity, many injuries that are not MSDs will become classified as MSDs, further escalating the national costs.

Another factor that is likely to increase the MSD count (though probably not significantly), is the number of injuries that occur as a result of activities performed outside of work (at home, playing sports, a second job, etc.), but are further aggravated by the employee's job activity. Further guidance from OSHA on how one should classify such injuries and how medical removal protection will be applied in such cases is needed to properly analyze the impact of potential increases to the number of reported MSDs.

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<sup>10</sup> These data suggest that it is important to specify the severity of the injury or illness when determining whether it constitutes an MSD. To avoid escalating the cost of the program, OSHA should address whether an injury constitutes an MSD when it requires a worker to stay away from work, or when the work is impaired, or even when work is not impaired but a worker complains. OSHA must propose a scheme that provides guidance for determining the threshold level of the severity of an injury before it constitutes an MSD.

**TABLE 2**

**Musculoskeletal Disorders (MSDs)**

(Number of Cases With Days Away from Work, 1996, Private Industry)<sup>11</sup>

Type of Injury/Illness	MSDs				Total Injuries
	Over-Exertion	Repetitive Motion	Bending, Climbing, etc.	Total	
Sprains, strains & tears	424,290	12,872	Unknown	Unknown	819,658
Back pain, hurt back	28,046	861	Unknown	Unknown	52,046
Soreness, pain, hurt, except back	17,984	5,811	Unknown	Unknown	73,542
Carpal tunnel syndrome	0	29,809	Unknown	Unknown	29,937
Hernia	25,819	322	Unknown	Unknown	29,624
Musculoskeletal system	7,761	18,278	Unknown	Unknown	35,238
<b>Total</b>	503,900	67,953	75,491	<b>647,344<sup>12</sup></b>	1,040,045

Source: Bureau of Labor Statistics

<sup>11</sup> BLS provides statistics related to injuries and illnesses for private industry only. However, the proposed rule would cover public industry as well. Note that the total number of injuries and illnesses with days away from work, as given in this table, in 1996, were 1,880,525 and total number of MSDs were 647,344. Based on this information, we assume that every third injury and illness with days away from work will result in an MSD(647,344/1,880,525). This assumption has been made consistently throughout this report to convert the injury and illness rates into MSD rates.

<sup>12</sup> OSHA uses this figure of 647,344 to calculate the cost and benefits of the ERGO program. Note that in the last row, the figure of 75,491 has been calculated by subtracting MSDs for overexertion (503,900) and repetitive motion (67,953) from the figure of 647,344.

**TABLE 3**

**Different Types and Number of Injuries & Illnesses**  
Private Industry Only, 1996

<b>Type of Injury/ Illness Case</b>	<b>Number of Cases</b>
Total Cases	6,238,900
Cases with Lost Work Days	2,832,500
Cases with Days Away from Work	1,880,500
Cases without Lost Work Days	3,406,400

Source: Bureau of Labor Statistics

Table 4. Evidence for Causal Relationship between Physical Work Factors and MSDs					
BODY PART		Strong Evidence	Evidence	Insufficient Evidence	Evidence of No Effect
Risk factor		(+++)	(++)	(+/0)	(-)
<b>Neck and Neck/Shoulder</b>					
Repetition			x		
Force			x		
Posture		x			
Vibration				x	
<b>Shoulder</b>					
Repetition			x		
Force				x	
Posture			x		
Vibration				x	
<b>Elbow</b>					
Repetition				x	
Force			x		
Posture				x	
Combination		x			
<b>Hand/wrist</b>					
<i>Carpal Tunnel Syndrome</i>					
Repetition			x		
Force			x		
Posture				x	
Vibration			x		
Combination		x			
<i>Tendinitis</i>					
Repetition			x		
Force			x		
Posture			x		
Combination		x			
<i>Hand-arm vibration syndrome</i>					
Vibration		x			
<b>Back</b>					
Lifting/forceful movement		x			
Awkward Posture			x		
Heavy physical work			x		
Whole body vibration		x			
Static work posture				x	

### **3. Number of Establishments Affected**

The cost of the Basic (Phase I) program have been estimated by assuming that 2,720,000 establishments will have to implement the program. OSHA does not explain how it estimated the figure of 2.72 million. The Basic program applies to all entities that have “manufacturing” and “manual handling” jobs. Under the proposed rule, the requirements of the Basic Program have to be met if manual handling is a "regular" part of employees' job duties. The question is "what is a regular part of the job?" Would 1/2 hour devoted each day to manual handling by one employee force the company to institute the Basic program? In many establishments, especially small businesses, employees are required to be versatile. Spending 1/2 hour on manual handling by at least one employee in a small establishment such as a book or shoe store, is not that unusual. Thus, depending on the interpretation of "a regular part", the proposed rule may cover a much larger number of establishments. In private industry alone, the total number of establishments exceeds 6 million<sup>13</sup>. If it is assumed that most establishments will be required to implement the Basic program, the cost of the Basic program will increase from about \$622 million to well over \$1 billion. This increase does not even take into account the low estimates of managerial and staff time (to develop and set up the Basic program) that OSHA used to calculate the cost of the program.

### **4. Estimates of the Time Required to Set Up the Program**

Under the Basic program, the draft standard requires that the manager in an establishment obtain training, review past injury records, evaluate hazards in all jobs, establish record keeping procedures, communicate the new program to the employees, including providing information on recognizing signs and symptoms of MSDs, and assign responsibility for monitoring the implementation of the program. OSHA estimates that this can be accomplished in about 4.5 hrs of a manager's time and about 5 or 6 hrs of employees' time in an establishment with 15 employees. Accordingly, OSHA estimates that the Basic program will cost a company of this size only \$199.63.

It is most likely that a manager will have to spend several days just to learn and evaluate the Ergo standard and many more days to develop and implement an Ergo program. Because manual handling, repetitive motion and bending, crawling, etc. activities are conducted in practically all

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<sup>13</sup> Source: U.S. Census Bureau



jobs, almost all jobs at an establishment will have to be analyzed to even determine if the rule is applicable to it and what needs to be done to comply. Following this analysis, those employees will have to be informed and trained on the company's Ergo program. Table A-1 shows that it may take the "average" firm 70 hrs of personnel time and \$1,250 to buy training and communication materials to establish the Basic Program (as contrasted with OSHA's estimate of 10 hours). Thus, even a small establishment may have to spend about \$1,455 to establish the Basic Program. This means that the cost of the Basic program, rather than being \$622 million (as estimated by OSHA) may well amount to \$8.45 billion ( $622 \times 2,705/\$199.63$ ) if 2.72 million establishments are affected, or \$17.1 billion if 5.5 million establishments are affected.

The estimates of the time required to implement the Phase II program are similarly understated. OSHA estimates that it will take a manager 2 to 5 hrs. to identify and evaluate appropriate controls, that a consultant will be required only 10% of the time, and that the consultant's cost will be only \$1000. It takes considerable time and expense to evaluate a job, obtain costly expert assistance and develop cost effective options. A consultant, who has knowledge of the industry and of the feasible controls, will cost considerably more than \$1,000. In addition, the management will have to spend considerable time and effort in finding and implementing optimal solutions. One can obtain a sense of the time required to find any solution, much less an optimal solution, by reading OSHA's descriptions of its own case studies given in Appendix C <sup>14</sup>. Even the time estimated by PP&E to implement Phase II of the program, 38 hrs. (\$927 per MSD) is likely to be highly understated. Even if we ignore the cost of Medical Removal Protection and the costs of hazard control, PP&E estimates that Phase II of the program will cost \$600 million ( $\$927 \times 647,344$  MSDs) if OSHA's estimates of number of MSDs and its methodology are used in the making the estimate. In comparison, OSHA has estimated that this phase of the program will cost only \$284 million, or \$316 million less than PP&E's rather conservative estimates.

## **5. Cost of Medical Removal Protection**

### **a. The Basic Provisions**

OSHA has added Medical Removal Protection (MRP) to the proposed program standard in an effort to remove any barriers that an employee may encounter in reporting MSDs and to

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<sup>14</sup> Appendix C contains three studies taken from OSHA's ERGO web site. They deal with Punch Press, Lifting and Sewing Machine operations respectively. Every one of the descriptions suggests that it will take considerable thought and expense before any controls can be developed and identified.

compensate workers for all lost wages and benefits. Under current laws and regulations, during the first six months of injury, workers suffering from MSDs can take leave from work, or they can be placed in light duty jobs; however, they lose their wages if they are not covered by workers' compensation, or a portion of their benefits even if they are covered by worker's compensation plans. Workers assigned to lighter duty jobs sometimes receive less pay and/or lose seniority rights. The draft MRP provision would require the employer to compensate a worker for that portion of his salary that is not covered by worker's compensation during the first six months of the injury. In addition, the workers' seniority rights and benefits must be preserved by the employer.

#### **b. Potential Increase in the Direct Cost of This Provision**

OSHA estimates that each MSD will have a cost of \$1036 for this provision. This estimate consists of \$481 in lost fringe-benefits among those who are covered by worker's compensation (69% of the workers) and \$2,264 among those who are not covered by worker's compensation (31% of the workers)<sup>15</sup>. However, even if we assume that these figures are correct, the estimates of medical removal protection may be underestimated.

The real cost of this provision is not in the benefits foregone by those who currently stay away from work, but in the benefits that may be claimed by those who currently stay at work after being injured but who appear to be eligible for the full 6 months allowed under the MRP provision. There will also be costs incurred as a result of those who make false MSD claims in order to receive up to 6 months leave with pay. In every company, for every one who claims such benefits now, it is not unreasonable to estimate that one or two additional people are likely to claim such benefits. Assuming that only one person claims additional benefits, an employer's costs will increase by \$3,120 per year for this provision (see page 39). This estimate is based on the fact that, on average, a worker stays away from work for only 16 days. However, if an average worker takes advantage of this provision and stays away for a much longer period, the cost of this provision can increase dramatically. If a person stays away from work for a period of 6 months, the cost of this provision will be \$25,350 per MSD.

Assuming that the pattern of those who "stay away from work" does not change (1.8 million, see Table 3), and that an additional 1.0 million people would claim to suffer from MSDs, and that the

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<sup>15</sup> These estimates of Medical Removal Protection are based on the cost of an average claim of \$8,000 as discussed elsewhere in this report.

cost of each MSD is \$3,120, the MRP provisions will immediately add \$3.12 billion per year to the cost of the rule. The MRP provisions alone would then exceed OSHA's estimates of the total cost of the rule. If employees start to stay away from work a bit longer to take advantage of the leave with full pay provision, the cost of the rule will be even greater. This increase will remain in effect until some reduction in the number of injuries and illnesses is achieved by implementing the proposed rule.<sup>16</sup>

### **c. Potential Increase In Worker's Compensation Premiums**

One of the unintended effects of the Medical Removal Protection provision may well be that it results in an increase in worker's compensation claims. OSHA claims, without providing any data, that the rule will decrease MSDs by 25% to 75%. Assuming that OSHA's estimate is correct, the number of workers' compensation claims will be reduced by between 161,836 and 485,508 (25% and 75% of 647,344) if additional claims are not made as discussed in the previous paragraph. This would mean that the decrease in worker compensation premiums will range from \$504 million and \$1.52 billion, if we assume that the cost of one MSD is \$3,120. One should note that unlike many other costs of the rule that may be one-time costs, the costs of the MRP are costs that will be incurred by employers annually.<sup>17</sup>

This reduction, however, may be overwhelmed by the estimated 1.0 million MSDs *without* days away from work (which do not involve workers' compensation claims) that may become MSDs *with* days away from work due to the eligibility for full compensation provided by the MRP provision. With the availability of the MRP provision, workers will be more likely to stay away from work and receive full pay and benefits. Thus, the total number of MSD cases involving worker compensation claims may experience a net increase of about 688,000, even if the rule reduces all MSDs by 25%. Similarly, if the rule eliminates 75% of all MSDs there may be a decrease of only 236,000 because more workers will be staying away from work and collecting workers' compensation payments. Under the assumption that the cost of each MSD is \$3,120, the new rule may increase worker's compensation premiums by about \$2.1 billion if the number

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<sup>16</sup> An overall increase in the number of MSDs will increase the yearly cost of the rule for the many years in the future. One should also note that the MRP provisions become effective upon the occurrence of the first MSD. The hazard control provisions become effective 2 years after the occurrence of the first MSD and the reduction of MSD will occur upon the successful implementation of the Ergo program. Therefore, it will be several years before the effect of the provisions on worker's compensation premiums and on injuries will be observed. In the meantime, one should see a considerable increase in worker's compensation premiums.

<sup>17</sup> Note that OSHA estimates that the lost output due to one MSD is \$22,545. PP&E disagrees with this estimates as described in Appendix B. If we use OSHA's estimates, the estimated decreases will be about 7 times larger, but the net increases will also be about 7 times larger.

of MSDs is reduced by 25%. However, if the number of MSDs decreases by 75%, the premiums may decrease by about \$736 million.

If medical removal protection is provided, it is important to specify how severe an injury has to be before a person takes leave. Opposition to the MRP provisions of the standard from small businesses consulted during the panel process is some indication of the large costs that employers are anticipating they will have to pay. Insurance companies may likewise be concerned about the costs of the MRP provisions, because they have led the effort over at least the last decade to reduce worker's compensation costs, in part by reducing the time a worker stays away from work.<sup>18</sup> The MRP provision will substantially negate those efforts.

## **6. Cost of Hazard Controls**

Under the proposed rule, the employer must implement measures to eliminate or control MSD hazards to the extent feasible. OSHA's preferred method for controlling hazards is engineering controls. In the short-run, however, employers may institute work practice and administrative controls. For example, an employer may use personal protective equipment on an interim basis. Even after employing permanent controls, an employer must track its progress in controlling MSD hazards. The employer must continue to identify hazards while changing the existing equipment and implement additional controls as soon as possible. Thus, the rule places on-going obligations on employers to mitigate Ergo hazards.

Hazard control costs are estimated by OSHA to be \$1.55 billion per year (as shown in Table 1) based on the assumption that there are 647,344 MSDs/year and that the controls will cost \$2400 per MSD. Assuming that the number of MSDs will increase by 1.0 million in the future and assuming that the \$2,400 figure is correct, the cost of hazard controls may well exceed \$3.0 billion per year.

OSHA estimated that the implementation of hazard control will cost \$2400/MSD. This estimate is based on two other assumptions for which OSHA did not provide any rationale, --- (1) that only 3 employees will be affected by an MSD, and (2) that the cost of controls will be \$800 per affected employee. Not many changes can be made for \$2,400 in most plants, or even with an

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<sup>18</sup> For details on worker compensation programs, see for example, "Workers' Compensation Medical Care: Effective Measurement of Outcomes", Kate Kimpan, Editor, Workers Compensation Research Institute ((1996). and "Worker' Compensation: Benefits, Coverage, and Costs, 1996 New Estimates , National Academy of Social Insurance. (March 1999

expenditure of \$24,000 -- an amount that a high risk firm with 249 employees and with 10 MSDs per year is expected to incur to institute appropriate Ergo controls. The degree of opposition to the rule from small businesses consulted during the panel process is some indication of the large costs that might be imposed on employers. If the claimed 25-75% reduction in injuries could be achieved by spending only \$2,400 on hazard controls, then most employers would not be concerned about the rule.

The employers' concern about the rule perhaps arises from the potential reach of the rule to the changes that might be required in manufacturing plants. In almost all jobs in which employees regularly bend, climb, crawl, or stretch their bodies to lift or otherwise manually handle objects, or in which they may conduct repetitive activities, or in which they may sit or stand in incorrect postures are candidates for Ergo control. This means nearly all jobs might be subjected to these requirements. According to the proposed rule, the occurrence of even one MSD will initiate the evaluation and implementation of the controls. Thus, eventually, the rule may affect the design of a significant portion of a firm's existing machinery. Therefore, this assumption of \$2,400/MSD may not be valid. In the absence of data based on actual experience, it is difficult to develop "average" costs of the controls and therefore, the cost of this provision cannot be determined. However, based on the comments made by small entities during the SBREFA panel process, hazard control costs promise to be much larger for some firms. For example, one firm spent well over \$100,000 on instituting hazard controls in jobs affecting only 80 employees.<sup>19</sup>

## **7. On-Going Program Costs**

OSHA's cost estimates have not accounted for the cost of the on-going program. The rule requires that even if another MSD does not occur for a period of 3 years after implementing the full program, an employer must maintain implemented controls and continue training employees. If problem jobs are not controlled adequately, employers must continue the program, respond promptly to identified or reported MSDs, track their progress in eliminating MSDs, examine ergonomic needs whenever existing machinery is upgraded or replaced, and look at priorities and develop a control plan for MSD hazards.<sup>20</sup> However, OSHA's intent is to eliminate MSDs altogether over time. The proposed rule also requires that training and information be carried out both *periodically* and *regularly*, without specifying a time line. Frequency and scheduling are left to the individual manager's discretion. Thus, the proposed program will impose costs on employers on an on-going basis. These costs should be included in the overall cost of the

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<sup>19</sup> See full SBREFA panel report, including Small Entity Representative (SER) comments.

<sup>20</sup> A Problem Job is any job in which you must set up a full ergonomics program, including job hazard analysis.

proposed rule.

In summary, even if we use OSHA's method of calculating the cost of the rule, the initial cost of the rule is likely to be quite different than the \$2.8 billion estimated by OSHA. The following provides an idea of the true cost of the regulation.

- The increase in the number of cases claimed as MSDs will increase the total cost to \$8.46 billion.
- The cost of the Basic program, based on realistic estimates of the time required to develop and implement the program, may well exceed \$4.5 billion (even if it is assumed that the number of affected establishments have been correctly estimated by OSHA).
- The cost of Medical Removal Protection is expected to be substantially more than the \$670 million estimated by OSHA. Initially, the MRP provisions may increase the estimated costs to \$3.12 billion per year, and could eventually lead to a permanent increase in worker compensation premiums of \$2.1 billion per year if injuries are reduced by only 25%. The rule will result in a decrease in the premiums only if more than a 60% reduction in injuries is achieved. In the latter case, total premiums are likely to decrease only by about \$0.5 million -- not a significant reduction in costs.
- The cost of hazard controls are highly underestimated at \$1.55 billion. Actual costs are likely to be several times higher.
- The on-going costs of the program have not been calculated in OSHA's total estimate.

This chapter also suggests that in order to realize net benefits from the rule, it is important to specify with much greater precision: (1) which injuries qualify as MSDs; (2) which MSDs qualify for staying away from work and for how long, and; (3) which MSDs should induce the reengineering of work practices or machinery in a plant. Otherwise, the rule promises to be very expensive. The next chapter suggests several ways in which the costs of the rule could be reduced substantially.

### **III. REGULATORY ALTERNATIVES AND FLEXIBILITY BASED ON MSD INCIDENCE RATES**

The previous chapter focused on the national cost of the proposed rule. In contrast, this chapter addresses the concerns of small entities. The types of injuries and illness, their incidence rates in different types of establishments (and industries) and the costs and benefits facing firms of different hazard-risks are addressed. The analysis, which OSHA did not perform, provides the context for providing regulatory relief to small business. Five alternatives to OSHA's draft Ergo standard are analyzed in the following sections.

#### **A. REGULATORY ALTERNATIVE NO. 1 -- Limit the Regulation to Manual Handling Jobs Only**

One alternative is to develop an ergonomics rule that would be applicable to Manual Handling jobs only. OSHA and NIOSH information on types of injuries that are considered to be MSDs provide the basis for suggesting this alternative. Manual Handling is defined in the draft Ergo standard as "physical work activities meeting these criteria: (1) they involve lifting/lowering, pushing/pulling, or carrying; and (2) they involve exertion of considerable force because the particular load is heavy or the cumulative total of the loads during a workday is heavy (e.g. substantial loads); and (3) these manual handling work activities are a significant part of the employee's regular job duties." Two sets of data suggest that Manual Handling causes a large majority of Ergo problems.

According to NIOSH, the total number of cases involving overexertion or repetitive motion was 705,800, 86.9%(613,224) of which was due to overexertion. Of the overexertion injuries, 367,424 were due to overexertion when lifting, 93,325 were due to pushing and pulling, 68,992 were caused by holding, carrying, or turning objects, and 83,483 were due to other causes.<sup>21</sup> OSHA criteria for defining manual handling consists of operations that involve lifting/lowering, pushing/pulling, or carrying. Therefore, in accordance with this definition almost 75% of overexertion and repetitive motion injuries and 86.3 % of overexertion injuries can be attributed

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<sup>21</sup> See the Executive Summary in "Musculoskeletal Disorders and Workplace Factors -- A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the neck, Upper Extremity, and Low Back", US Department of Health and Human Services, National Institute For Occupational Safety and Health, July 1997.

to Manual Handling.

The 1996 data given in Table 2 are similar to the 1994 data collected by NIOSH. The table shows that:

- of the 647,344 MSDs , 503,900 (78%) were caused by overexertion, and of the latter, 424, 290 (or about 66%) involved general sprain, strain and tear, and
- all other MSDs, amounting to about 22%, are caused by Repetitive Motion and Bending, Climbing, Crawling, etc..<sup>22</sup>

Therefore, by focusing its program on Manual Handling alone, OSHA could address 78% of MSDs. This is in accordance with NIOSH's findings that the vast majority of overexertion injuries are most likely caused during lifting, pushing, pulling, and carrying of heavy objects; that is, while doing manual handling jobs.

Given the predominance of manual handling injuries, OSHA should consider promulgating a rule that affects only these operations. Such a rule will help all employers, large and small, to focus on specific jobs (manual handling) in their operations. Companies will not have to identify all problem jobs, but only problem jobs that involve manual handling. Likewise, the requirements to interview other employees in similar job situations, to examine past records for evidence of the occurrence of MSDs, and to provide special training to managers will be limited to those problem jobs that involve manual handling. Under such a rule, companies could develop strategies for lowering the rate of MSDs in the most cost effective manner by targeting specific types of jobs (i.e., manual handling jobs). Employers who do not normally provide training to their employees in properly lifting, pushing/pulling and carrying heavy objects, could be required to do so. Other employers, who *do* regularly train their employees, could be required to undertake such measures as those contemplated by the proposed rule. The latter could focus on changing work practices and/or production machinery to minimize manual handling operations, or to concentrate on providing tools that aid in conducting such activities.

A standard which targets manual handling jobs will also help to focus on the needs of particular industries that have high rates of MSDs. Such industries include: Nursing & Personal Care;

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<sup>22</sup> Carpal Tunnel Syndrome injuries, that have attracted considerable attention, amounted to only about 4.5% of the total MSDs



Food Products Machinery; Bottled and Canned Soft Drinks; Beer, Wine and Distilled Beverage (wholesale), Coal Mining, and Mattresses and Bedspring Manufacturing (Table 5). The data in Table 5 suggests that the incidence rates in these industries are 2.8 to 3.8 times those in the entire manufacturing industry. Based on anecdotal information, it appears that the injury and illness rates in these industries are high because they contain relatively high proportion of manual handling jobs and because their workers may not be as well trained as in many other industries involving manual handling jobs.

The government may also find it more effective to regulate these high hazard industries. For example, based on best management practices, it could establish MSD reduction targets for companies. It could also develop knowledge of practices that reduce injuries and that are cost effective. Correspondingly, it could develop and disseminate practical information on developing effective strategies to establishments in specific industries. In other words, it could target its regulatory programs to those industries that have the highest overexertion injury rates, thereby drastically reducing those injuries. The results of the cost benefit analysis in Chapter IV also suggest that business in these industries will be more amenable to accepting the regulatory requirements because the benefits are likely to exceed the costs of the rule.

**Table 5. Private Sector Industries With the Highest Incidence Rates of Injuries and Illnesses From Overexertion in Days Away From Work**

<b>Industries</b>	<b>Incidence Rate Per 100 workers</b>
Nursing & Personal Care	3.18
Air Transportation (Scheduled)	3.07
Travel Trailers	3.03
Food Products Machinery	2.60
Bottled and Canned Soft Drinks (manufacturing)	2.55
Beer, wine and distilled beverages (wholesale)	2.55
Coal Mining	2.36
Mattresses and bedspring (manufacturing)	2.33
<b>Comparison Industries</b>	
All Manufacturing	0.83
All Private Industry	0.76
Finance, insurance and real estate	0.18

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Source: "Musculoskeletal Disorders and Workplace Factors, A Critical Review....", By NIOSH, 1997.  
Original Data obtained from BLS.

## **B. REGULATORY ALTERNATIVE NO. 2 --- Exempt Manufacturing Industry From the Basic Program**

Under the proposed ergonomics program standard, the Basic program (Phase I) is required of all establishments in manufacturing, and manual handling upon the promulgation of the standard. Other establishments would need to establish the full program (Phases I & II) only when an MSD occurs. This section examines whether it is appropriate to require all manufacturing firms to set up the Basic Program. The analysis is based on the comparison between the injury and illness rates in manufacturing establishments and those in industries that have been exempted from the Basic program requirements.

The manufacturing industry has a high average MSD incidence rate. As shown in Table 6, MSDs occur at average rates of 0.58/establishment for manufacturing, 0.09/establishment for retail and wholesale trade, and 0.083/establishment for services. This means, on average, one MSD occurs approximately every two years in an average manufacturing establishment as contrasted with one in every 11 or 12 years in retail and service establishments. These rates probably provide OSHA's rationale for exempting trade and service industries from the Basic program requirements, and subjecting manufacturing industries to the Basic program. As the following sections demonstrate, the average MSD incidence rate is not adequate justification for requiring all manufacturing firms to implement the Basic program.

### **1. Manufacturing Firms with Low Rates of MSDs**

These average data, given above, do not accurately reflect the status of injuries in small establishments in the manufacturing industry. The injury and illness rates for the vast majority of small businesses in the manufacturing industry are similar to (or even lower than) the incidence rates in trade and service industries; therefore, they should be exempted from the Basic program requirements. Table 7 provides estimated incidence rates for manufacturing establishments in different size and quartile categories. The first quartile represents those 25% of the establishments (in each size category) whose MSD rates are lower than the figure given in the appropriate cell. For example, 25% of the establishments in the 250-999 employee size category will experience an MSD rate of less than 0.03 per 100 employees per year. Accordingly, the incidence rate for a firm of 500 people will be 0.15 (0.03 x 5), that is, on average, one MSD will

occur every six years.

**TABLE 6. MSD Distribution by Industry Total All Size Classes (1994)**

<b>IIEM</b>	<b>Manufacturing</b>	<b>Retail &amp; Wholesale Trade</b>	<b>Services</b>	<b>All Industries</b>
<b>Number of Establishments*</b>	390,435	2,089,505	2,392,015	6,612,721
<b>Number of Employees*</b>	18,611,108	27,693,151	34,709,644	100,314,946
<b>Number of Events Causing MSDs**</b>	226,806	187,923	199,534	718,101
<b>Employees per MSD Event</b>	82.06	147.36	173.95	13.97
<b>MSD Events per Establishment</b>	<b>0.58</b>	<b>0.09</b>	<b>0.08</b>	<b>0.11</b>
<b>Years Before One (1) MSD Occurs</b>	2	11	12.5	9

Source: U.S. Small Business Administration, 1995.

\*\* Calculated by using the data obtained from the BLS web site. Note that the statistics given in this table differ slightly from those developed by NIOSH and discussed earlier. This difference results from the differences in different definitions of MSD used by OSHA and NIOSH.

As shown in Table 7, the incidence rate in several categories is even lower. For instance, the rate:

- in the first three quartiles of the 1-10 employee size category is zero,
- in the first two quartiles of 11-49 employee size category is zero,
- in the first quartile rate of the 50-249 employee size category is zero.

Therefore, 75% of those establishments with fewer than 11 employees, 50% of those with 11-50 employees, and 25% of those with 50-249 employees will experience almost no MSD

incidents, yet OSHA has not exempted these establishments from the Basic Program requirements. Furthermore, 75% of the firms with less than 100 employees will experience an MSD once every six years. Nevertheless, they, too, will have to set up the Basic Program under the proposed rule. Most establishments will establish the program, incur the associated costs, and then, on average, wait many years for an MSD to occur before implementing Phase II of the program. The benefits of setting up the Basic programs can almost never exceed its costs for these firms. Therefore, they should be exempted from the Basic requirements. The cost-benefit analysis in Chapter IV supports this conclusion.

## **2. Manufacturing Firms With High Rates of MSDs**

MSD incidence rates in the fourth quartile of all business size categories are much higher than those in the first three quartiles (see Table 7). Fourth quartile MSDs rates vary from 2.0 per 100 employees in the less than 10 employee category, to 4.03 per 100 employees in the 50-249 employee category. In comparison, none of the rates in the first three quartiles exceeded 0.17 MSDs per 100 employees. The high rates in the fourth quartile could result from either the high rates experienced by specific industries (as shown in Table 5), or inadequate hazard controls in some establishments. In either case, firms in this quartile should be subject to not only the Basic program, but also the Full program. However, they should be treated in exactly the same manner as high hazard firms in trade, transportation, and services industries. Since, high hazard firms in other sectors are not required to set up the Basic program, high hazard firms in the manufacturing sector should also be relieved from this burden. *Hence, all firms in the manufacturing sector should be exempted from the requirements of the Basic Program.*<sup>23</sup>

Based on the fact that the Basic program will cost about \$2,700 for a firm of 15 employees, and that 18.6 million persons are employed in about 390,000 establishments in the manufacturing sector, this exemption is likely to save billions of dollars. About 25% of the establishments, the ones with high hazard, will have to eventually set up the program, but the 75% may never have to do so, especially if the next regulatory alternative is adopted.

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<sup>23</sup> As discussed in the Chapter IV, the high risk firms will be forced to set up both the basic and the Full program (Phases I & II) relatively quickly after the promulgation of the rule, because they experience multiple MSDs every year. Once an MSD (or two or three MSD, depending upon the trigger criterion) occurs, the firm will have to establish both the Basic and the Full program. A firm can be expected to spend less money if it establishes Phases I & II of the program simultaneously than if it establishes them at different times.

**Table 7.**  
**Estimated Rates of MSD Incidence With Days Away from Work By**  
**Quartile Distribution and Size Group for *Manufacturing* per 100 Workers (1996)\*\***

<b>Establishment Size Group</b>	<b>Average</b>	<b>1st Quartile (25% of estab. With rate lower than)</b>	<b>2nd Quartile (50% of estab. With rate lower than)</b>	<b>3rd Quartile (75% of estab. With rate lower than)</b>	<b>4th Quartile (estimate*) (Mean rate of the highest 25%)</b>
1—10	<b>0.50</b>	0.00	0.00	0.00	2.00
11—49	<b>0.93</b>	0.00	0.00	0.13	3.60
50—249	<b>1.06</b>	0.00	0.07	0.17	4.03
250—999	<b>0.77</b>	0.03	0.07	0.10	2.87
1000+	<b>0.63</b>	0.00	0.03	0.07	2.43

Source: Bureau of Labor Statistics

\* These means are accurate only for the manufacturing industry as a whole and for establishments with fewer than 10 employees. Means of the 4<sup>th</sup> quartile for other size categories are conservative and represent the absolute minimum possible mean.

\*\* It is assumed that MSDs are approximately one-third of all injuries and illnesses with days away from work. The 647,344 MSDs resulting in days away from work make up approximately one-third of the 1,880,525 total of all injuries and illnesses resulting in days away from work. It is also assumed that the rate of incidence of MSDs (with days away from work) among different size and quartile categories (given in this table) is approximately one third the rate of incidence of all injuries and illnesses with days away from work given in Table A-6. Even if this assumption is not completely true, the arguments made in this section are still valid.

Comparative Incidence Rates for all injuries and illnesses with days away from work in Manufacturing, Trade and Service industries are given in Tables A-6, A-7 and A-8 respectively.

**Table 8.**  
**Estimated Average Number of Years Before an MSD Occurs**  
 (Based on Incidence Rates in Table 7 and  
 For the Largest Establishment in Each Size Group)\*

<b>Establishment Size Group</b>	<b>Average</b>	<b>1st Quartile (25% of estab. With rate lower than)</b>	<b>2nd Quartile (50% of estab. With rate lower than)</b>	<b>3rd Quartile (75% of estab. With rate lower than)</b>	<b>4th Quartile (estimate*) (Mean rate of the highest 25%)</b>
1—10*	20	~	~	~	5
11—49*	2.15	~	~	15	<b>0.56</b>
50—249*	0.38	~	5.71	2.35	<b>0.1**</b>
250—999*	0.77	3.3	1.43	1	<b>0.035</b>

\* Maximum size used for calculations as follows: 1-10 Employee Size Group = 10; 11-49 Employee Size Group = 50; 50-249 Employee Size Group = 250; and 250-999 Employee Size Group = 1,000. Number of Years are calculated as follows. Number of MSDs per year (x) = incidence rate x establishment size/100. Number of years before an MSD occurs = 1/x

\*\* This means that 1/0.1 or 10 MSDs will occur during one year. In the 11- group and in this quartile, about 2 MSDs will occur every year and in the 250-999 group and in this quartile, about 30 MSDs will occur every year. This means that more than one MSD occurs only in the 4<sup>th</sup> quartile firms and only in firms with greater than 50 employees.

~ Implies approximately infinity or never or many, many years.

**Table 9.**  
**Estimated Average Number of MSDs Per Year**  
 (Based on Incidence Rates in Table 7 and  
 For the Largest Establishment in Each Size Group)\*

<b>Establishment Size Group</b>	<b>Average</b>	<b>1st Quartile (25% of estab. With rate lower than</b>	<b>2nd Quartile (50% of estab. With rate lower than</b>	<b>3rd Quartile (75% of estab. With rate lower than</b>	<b>4th Quartile (estimate*) Mean rate of the highest 25%</b>
1—10*	.05	0	0	0	0.2
11—49*	0.465	0	0	0.065	<b>1.8</b>
50—249*	2.65	0	0.175	0.425	<b>10</b>
250—999*	7.7	0.3	0.7	1.0	<b>28.7</b>

- \* Maximum sizes used for calculations are as follows: 1-10 Employee Size Group = 10; 11-49 Employee Size Group = 50; 50-249 Employee Size Group = 250; and 250-999 Employee Size Group = 1,000. Number of Years are calculated as follows. Number of MSDs per year (x) = incidence rate x establishment size/100.

~ Implies approximately infinity or never or many, many years.



### **C. REGULATORY ALTERNATIVE NO. 3 -- Establish a Criterion of Two or More MSDs for Triggering the Full Program**

Under the proposed rule, employers are required to implement the Full program ( or Phase II of the program, if in manufacturing) when an MSD occurs (whether it is with or without days away from work). Since the Phase II program accounts for the vast majority of the program costs (see Table 1), the triggering of the program promises to impose considerable costs on employers. Among other things, the Medical Removal Protection provision becomes effective immediately and the affected employers will have to identify, evaluate and implement feasible control measures to control the hazards.<sup>24</sup> This section evaluates whether the one (1) MSD threshold makes economic sense. The following factors may be considered in developing a threshold.

#### **1. Exclusion of Low Risk Establishments**

A large number of manufacturing establishments experience low rates of MSD incidence. These low incidence rates provide one reason why a threshold should be considered. In Table 9, the incidence rates given in Table 7 have been converted into the average number of MSDs per establishment per year that are likely to occur in each establishment size category. The data shows that 75% of all establishments with 1,000 employees will experience, at most, one MSD per year. For 75% of establishments with fewer than 1,000 employees, the rates are much lower than 1 MSD/year. For six of the 12 segments, no MSDs are expected to occur in a given establishment in a given year. For such establishments (that is, establishments with low incidence rates) the costs of setting up and implementing the Ergo program are likely to far exceed the benefits of implementing the program (more on this later).

The rates in the higher risk, fourth quartile are another story. A firm with 49 employees in this quartile is likely to experience about 2 (1.8) MSDs per year. A firm with 249 employees, is likely to experience 10 MSDs per year and a firm with 1,000 employees is likely to experience 28.7 MSDs per year. Only in firms with 10 or less employees, the number of MSDs is less than one per year. Their maximum incidence rate is once every five years.

Even in a firm in which MSD rates are small, for example, a 249 employee firm in the second

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<sup>24</sup> . If for some reason, they do not implement hazard controls, they will have to pay lost wages and benefits to workers under the Medical Removal Protection provision and thereby pay higher worker's compensation premiums.

quartile, there is a some probability that an MSD can occur at any time. Even though one MSD is supposed to occur every six years in these establishments, an MSD can occur (with a very small probability) during the first or second year of the six year cycle. Supposing it occurs at the end of the first year, the next MSD, will most likely occur 11 years later (since the average frequency for this category of firms is one MSD every six years). Once the first MSD occurs, Phase II of the Ergo program will be triggered; the employer will then spend money instituting hazard controls, but will have to wait many years before any benefits are realized because, on average, an MSD only occurs once every six years in the absence of the program.<sup>25</sup> The long wait between the two MSDs makes the rule costly for low risk firms with little offsetting benefit (see Chapter IV). This means, some notion of time must be introduced in the criteria for triggering the program. The criteria could be changed from just 1 MSD to 2 MSDs per year, for example.

## **2. Inclusion of Systemic Injuries Only**

MSDs are supposed to be systemic injuries. Therefore, a notion of "non-accidental" injury should be considered by requiring that more than one MSD has to occur in a given job and in jobs similar to it, before Phase II of the program is triggered. The occurrence of one MSD does not necessarily imply an on-going problem. Multiple MSDs in a job are more likely to suggest the presence of a systemic problem. Such a threshold would be particularly important in large companies. In large establishments, a number of different jobs are likely to exist in which overexertion, repetitive motion and bending, crawling etc. are an inherent part of the activities. Even if multiple MSDs occur in a given year, more than one MSD may not occur in a given class of jobs. Therefore, the above criterion should be modified to provide that the Full program does not begin until at least 2 MSDs occur in a given job or jobs similar to it.

## **3. Inclusion of High Risk Industries**

The third criteria for the threshold should be based on the idea that firms with "high risk" should come under the regulatory purview while those with low risk should be excluded. Based on the data in Table 9, firms in the first three quartiles should be excluded from the requirements of the standard and those in the fourth quartile should be included in the regulation. This can be done by establishing the threshold at 2 MSDs per year. As shown in Table 9, most fourth quartile firms in 11-49, 50-249, and 250-999 size categories will exceed this threshold. Therefore, under

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<sup>25</sup> Note that the main benefit of the Full program will be to postpone the occurrence of next MSD several years, in this case from say six years to 12 years, if a reduction of 50% in injuries and illnesses is achieved.

this scheme, most high risk firms with more than 50 employees will be covered by the regulation. A different regulatory scheme should be developed in order to cover high risk firms with less than 50 employees.

#### **4. Exclusion Of MSDs Without Days Away From Work**

The fourth consideration in developing the criteria is that injuries that do not currently involve days away from work may do so after the program becomes effective. As discussed in the previous chapter, a portion of almost 1.0 million MSDs, (those involving impaired as well as unimpaired work) are likely to become MSDs with days away from work if the Medical Removal Protection provision is retained in its current form. The criterion of 2 MSDs/ job has been developed by using data on incidence rates of MSDs with days away from work. How should MSDs that do not currently involve days away from work be included in the criteria? One potential means to include such MSDs would be to increase the threshold from 2 MSDs to a higher number, perhaps 3 or 4 MSDs before Phase II is triggered.

*Based on the discussion above, a minimum threshold of 2 MSDs/job should be used to trigger the Full program. This threshold will exclude firms in which MSDs may occur very infrequently and will exclude jobs in which systemic injuries do not occur. Higher thresholds of 3 or 4 MSDs/problem job may be necessary to ensure that the MRP provision of the program is not abused.*

## **IV. REGULATORY ALTERNATIVES BASED ON COSTS AND BENEFITS**

This chapter examines the costs and benefits of the Ergo program from different perspectives. The purpose of the examination is to determine whether costs and benefits analysis supports some of the regulatory flexibility alternatives articulated in Chapter III and whether additional alternatives can be justified. This chapter consists of several major sections. Part A, describes the typical structure of workers compensation benefits by using the State of Wisconsin program as an example. It also qualitatively discusses costs and benefits facing workers and employers with and without the proposed rule. Finally, it describes the key assumptions for conducting the cost and benefit analysis. Part B examines the effect of increases in MSD incidence rates on the costs of the program to an employer. Part C presents the costs and benefits facing a typical low risk firm. Part D presents the costs and benefits facing a high-risk firm, but is divided into two subsections that discuss costs and benefits for firms in which injuries and illnesses are, respectively, either fully covered or not covered at all by worker compensation programs.

### **A. Introduction**

#### **1. Structure of a State Workers' Compensation Program**

Workers' compensation benefits depend on the legal requirements of a State program; however, most state programs are reasonably similar and any one of them can be use for illustrative purposes. The workers' compensation program in the State of Wisconsin perhaps provides a typical benefit structure consisting of temporary total disability and permanent partial disability benefits.<sup>26</sup>

##### **a. Temporary Total Disability**

Under Wisconsin's workers' compensation program, workers who miss more than 3 days of work because of a work-related injury or illness can receive temporary total disability (TTD) benefits. The benefits are based on a weekly compensation rate of two-third of the worker's pre-injury average weekly wage, subject to maximum benefits. The maximum weekly TTD benefit was \$378 for injuries occurring in 1990. If a worker returns to work full time or refuses a suitable job after being released to return to work, TTD benefits must stop. The maximum period for

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<sup>26</sup> All of the information regarding Wisconsin's program are taken from "Measuring Income Losses of Injured Workers: A study of the Wisconsin System", by Leslie Boden and Monica Galizzi, Workers Compensation Research Institute, Cambridge, MA; November, 1998

receiving TTD benefits is six months.

### **b. Permanent Partial Disability**

A worker in Wisconsin may be eligible for permanent partial disability benefits (PPD) after reaching the end of the healing period. If, at that time, a worker has an impairment that is less than total but is expected to remain unchanged, he or she is entitled to PPD benefits that are supposed to compensate a worker for the loss of earning capacity and for loss of bodily functions. The loss-of-earning-capacity benefits were limited to a maximum of \$131 per week in 1990. The maximum benefits are limited by the specified maximum duration of the benefits. For each percent of permanent disability of the body a worker can claim 10 weeks' of benefits. However, the State distinguishes between "schedule" and "non-schedule" injuries. Schedule injuries involve limbs, eyes, and ears. Injuries or conditions listed in the schedule are compensated on the basis of functional impairment only, without regard to loss of earning capacity. Non-schedule injuries include psychological claims and injuries to the head, back, or torso and the benefits are paid in two tiers. One tier pays only on functional impairment. The second tier pays benefits based on loss of earning capacity.

### **c. Litigated Cases**

The PPD payments also depend on whether the cases are litigated. In a study of 1985-1986 injuries in Wisconsin found that 32% of functional impairment and 89% of earning capacity claims involved representation by attorneys. It was estimated that 4% of these cases ended up in "compromise" settlements in which accrued medical and income benefits were much larger than in other cases and were paid as lump sums (see Table B-1 for payments in 1989-1990). Otherwise, lump sum payments are rare.

### **d. Incentives for Returning to Work Quickly**

The Wisconsin system provides incentives for employers to offer jobs and for workers to return to work when adequate healing has occurred. Wisconsin encourages employers to offer jobs to injured workers in two ways. First, the Worker Compensation Division can order an employer who unreasonably refuses to rehire an injured worker to pay up to 1 year's wages during the period of refusal to rehire. Second, workers with permanent impairments become eligible for higher earning-capacity benefits if they are not rehired by their pre-injury employers at 85% or more of their former earnings. The system provides incentives to encourage workers with

permanent impairment to return to work. These incentives primarily take the form of low PPD benefits and discouragement to obtain lump sum payments.

## **2. Qualitative Costs and Benefits of the Ergo Program**

In order to obtain a basic understanding of the costs and benefits facing a firm under OSHA's draft Ergo standard, it is helpful to examine the qualitative costs and benefits from both the employer's perspective and the employee's perspective (see Table 10). In the absence of the regulation, MSDs occur at regular frequencies, as shown in Table 9. The company makes regular workers' compensation premiums to cover its potential liabilities. When and if a worker gets hurt, the company probably loses some productivity due to the interruption in the services of the injured worker. The injured worker loses a part of his salary and benefits under TTD in the short run. However, if he is injured permanently, he may lose his earning capacity and/or may suffer the loss of limbs and associated functional impairment.

According to OSHA, the proposed rule will decrease the injury rate by 25% to 75%. As a result, an average worker will receive injuries with less frequency, and when he is injured, he will be fully compensated for any loss of wages and benefits. The employer, on the other hand, will have to bear the costs of developing and implementing the Basic and the Full program. He is likely to benefit mainly by reducing his workers' compensation payments. In a low-risk firm, the avoidance of rather infrequent injuries may not realize much savings and not put the firm in a lower-risk category. For example, in a 249 person low-risk firm, an MSD will now occur every 12 years rather than every six years,.

In a 249 person high-risk firm, on the other hand, the employer may reduce his injury rate by 5 MSDs per year if he achieves a 50% reduction in the MSD injury rate. The savings in workers compensation may be quite substantial; however, unlike in the past, he will have to compensate the injured employee for any loss of wages and benefits. The savings will also be offset by the cost of equipment changes (Hazard Controls) the firm will have to make. If the employer is lucky, the change in equipment may help him increase his productivity and defray some of his costs.

**Table 10. Costs and Benefits of the Ergo Program  
From the Employer's and Employee's Perspective**

Without Regulation	With Regulation
<u><i>From Employer's Perspective</i></u>	<u><i>From Employer's Perspective</i></u>
<b>Costs:</b>	<b>Costs:</b>
1. Current Worker's Compensation	1. Cost of the Basic Program
2. Loss of Productivity In Hiring Temporary Worker When MSD Occurs	2. Cost of the Full Program, including: a. Capital Equipment Changes b. Medical Removal Protection
<b>Benefits:</b>	3. Loss of Productivity in Hiring Temporary Worker When MSD Occurs
NONE	<b>Benefits:</b>
	1. Lower Workers' Compensation Premiums
	2. Potential Increase in Productivity by Using New Machinery.
<u><i>From Employee's Perspective</i></u>	<u><i>From Employee's Perspective</i></u>
<b>Costs:</b>	<b>Costs:</b>
1. Loss of Pay Due to Partial Compensation by Workers' Compensation	1. None
2. Potential Long-Term Health Effects	<b>Benefits:</b>
<b>Benefits:</b>	1. No Loss of Pay or Benefits
NONE	2. Fewer Long-Term Health Effects

### **3. Assumptions Regarding Hazard Control Costs and MRP Provisions**

The costs and benefits of the rule have been estimated for a low-risk and a high-risk firm. Both establishments have 249 employees, both experience an assumed 50% reduction in MSD rate, but they belong to different risk-groups. The first establishment belongs to the second quartile in Table 7 and experiences one MSD every six years. The second establishment belongs to the high-risk fourth quartile and experiences 10 MSDs every year.

OSHA's cost estimates, especially those pertaining to Hazard Control and Medical Removal Protection, are highly uncertain. OSHA has estimated that the cost of Hazard Control for the "average" establishment is \$2,400/MSD. However, OSHA does not distinguish between a low-risk firm and a high-risk firm. In a high risk establishment, that is, one with a large number of MSDs, one can expect that the cost of Hazard Controls will be much higher than those for a low risk establishment. The analysis presented here assumes that:

- A low-risk, 15 employee establishment will spend \$6,415.14 to Identify, Evaluate, and Implement Hazard Controls (see Table A-1). Of this amount, \$5,000 is attributed to materials and equipment while the remainder is allocated to consultant costs, managerial hours spent, etc.. An employer generally cannot make any reasonable "capital" improvements with \$5,000 in most establishments. However, this estimate assumes that low risk firms will rely more on less intensive "non-capital" fixes.
- A high-risk, 15 employee establishment will spend an average of \$55,488.40 to Identify, Evaluate, and Implement Hazard Controls (see Table A-2). Of this amount, \$50,000 is attributed to materials and equipment costs. This \$50,000 cost assumes capital improvements and is a conservative estimate.
- The cost of Hazard Control increases in direct proportion to the size of the establishment. This means that a low-risk 249 employee establishment will spend \$106,491 on Hazard Control ( $249/15 * \$6415.14$ ) and a high-risk establishment with 249 employees will spend almost \$921,107 to control hazards ( $249/15 * \$55,488.40$ ).

In comparison, OSHA's estimates are based on the number of MSDs only. According to OSHA,



the low-risk establishment with 249 employees would spend only \$2,400 on Hazard Control, and a high-risk, 249 employee firm will spend about \$24,000 to control hazards. If the costs of Hazard Control were as low as those purported by OSHA, there would be little or no opposition to the proposed rule.

OSHA assumes that the costs of MRP protection will be \$1,036/MSD. This is a weighted average of wages and benefits lost when injuries are covered by workers' compensation payments and of wages and benefits when injuries are not covered by workers' compensation payments. This report discards this structure. In Part B below, it assumes that MSD claims will increase substantially due to the MRP provision and that all injuries are covered by workers' compensation benefits and calculates the associated costs and benefits for the selected firms. In Parts C & D.1, it is assumed that MSD claims will not increase, and that all injuries are covered by workers' compensation. In Part D.2, the analysis assumes that no injuries are covered by workers' compensation.

## **B. Effect of MRP Provisions and Potential Increase in MSD Claims**

Under the proposed rule, an employer "must maintain the employee's total normal earnings, seniority rights and benefits, when work restrictions are recommended ...until the first of these occurs: (1) the employee is recovered and able to return to work; or, (2) effective measures are implemented that control WMSDs hazards to the extent the job does not pose risk of harm to the employee even during the recovery period; or, (3) there is a final medical determination that the employee is permanently unable to return to the job; or (4) 6 months have passed." The employer may reduce his obligation to maintain the employee's total normal earnings, seniority, rights and benefits by the amount that the employee receives from workers' compensation payments or from other compensation or insurance programs during the work restriction period. It is unclear from OSHA's definition whether or not a worker will be compensated for lost wages and benefits during the permanent disability period, or only during the temporary disability period.

As discussed in Appendix B, OSHA estimates that the value of an avoided MSD is equal to \$22,545. On the other hand, PP&E has estimated that the value of an avoided MSD is only \$3,120. These estimates consist of the following:

<b>Type of Savings</b>	<b>OSHA's Estimate<sup>27</sup></b>	<b>PP&amp;E's Estimate<sup>28</sup></b>
Cost of Wages		\$2,039
Temporary Total Disability.	\$ 3,419	
Permanent Partial Disability.	\$11,342	
Medical Costs	\$ 3,080	\$428
Ins. Adm. Costs	\$ 1,872	\$260
Indirect Costs	\$ 2,832	\$393
<b>Total Savings</b>	<b>\$22,545</b>	<b>\$3,120</b>
<b>Wages Lost by Worker</b>		
TTD (10%)	\$ 342	\$ 204
PPD (41%)	\$ 4,650	-
Total wages lost	\$ 4,992	\$ 204
<b>Net Savings to An Employer</b>	<b><u>\$17,553</u></b>	<b><u>\$2,916</u></b>

Under the MRP provisions of the proposed standard, the uncompensated wages associated with Temporary Disability (\$342) will be paid by the employer. Thus, prior to the implementation of this standard, an employer would pay \$17,553 in workers' compensation costs and indirect costs for each injured employee. After the standard is implemented, the employer will pay the same \$17,553, but will also have to pay an additional \$342 per injured employee (\$17,895 total) to cover the lost wages to the employee that are not paid by workers' compensation insurance. This increase in cost per injury reduces the net savings to the employer of the proposed standard<sup>29</sup>.

In comparison, if PP&E's estimates are used in the calculations, the employer will save \$2,916

<sup>27</sup> Numbers are drawn from Table B-1.

<sup>28</sup> Numbers are drawn from Table B-6.

<sup>29</sup> For example, let us assume that, prior to the implementation of the standard, an employer has 10 MSDs per year (year zero). The employer's costs, prior to the standard, therefore, are \$175,530 (\$17,553 x 10). Further, let us assume that implementing the standard reduces the employer's MSD rate to 9 MSDs per year (year 1 of the standard). The employer has thus saved \$17,553; however, he is now paying \$17,895 per injured employee to the remaining 9 injured employees. Thus, his total costs have decreased from \$175,530 to \$161,055 (\$17,895 x 9). The net savings to the employer are, therefore, \$14,475 (\$175,530-\$161,055) and not \$17,553 as is indicated by OSHA's methodology.

per MSD avoided, but will have to pay an extra \$204 in MRP payments for each MSD that still occurs.<sup>30</sup> Assuming an initial MSD injury rate of 2 MSDs/year, and a 50% reduction in MSDs due to the implementation of the standard, the net savings to the employer would be \$2,712 (\$2,916-\$204).

However, as noted previously, the more significant part of the MRP provision, the potential increase in MSD claims and the resulting increase in employer' costs, has not been considered by OSHA. In Chapter II it was estimated that MSDs could increase by as much as 1 million as a result of the MRP provisions. This means that for every one existing MSD, a company could experience an additional 1.54 MSDs. If this is so, and if Hazard Controls reduce the number of MSDs by 50%, a firm will still experience a net increase of 0.27 MSDs  $((1.54+1)/2 - 1)$  per existing MSD. Hence, assuming PP&E's estimate of benefit of \$2,916/MSD, the low-risk firm will experience a net increase of \$787 per existing MSD per year  $(\$2,916 \times 0.27)$ . In addition, it will pay \$259  $(204 \times 1.27)$  for lost wages and benefits. For the 249 employee low-risk firm, therefore, the cost of the MRP provision will increase by only \$1,046 every six years, that is, about \$174 per year for the foreseeable future.

Once again, using a discount rate of 10% and an infinite stream of these costs, the increase in costs would be \$1740. On the other hand, if we use OSHA's estimate of the benefit of the Ergo program, \$17,553/MSD, the increase in costs due to the increase in MSDs would be \$4,739  $(\$17,553 \times 0.27)$ . In addition, it will pay an additional \$434  $(342 \times 1.27)$  for lost wages for a yearly total increase of \$862  $((\$4,739 + \$434)/6)$  per year. The net present value of this increase is \$8,620. For the high risk firm, however, the costs of this provision will be much larger. This firm experiences 10 MSDs per year. The firm will experience a net increase of 2.7  $(0.27 \times 10)$  MSDs per year. Hence, the increase in the costs for a high-risk firm would be \$7,873 per year. In addition, it will pay \$2,591  $(12.7 \times \$204)$  per year for lost wages and benefits. The net present value of the total increase is \$104,640 if PP&E's estimate of the benefits is used. If, however, OSHA's estimate of the benefits (\$17,553/MSD) is used to make the estimate, the costs of this provision will be \$51,736  $(\$47,393 + \$4,343)$  per year or \$517,360 over a ten year period. Table A-3 presents this data along with data on the cost of Phases I & II of the program. It suggests that the if MSDs claims increase significantly, there are likely to be no measurable

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<sup>30</sup> Based on weighted average of benefits in different states, OSHA estimated the cost of Medical Removal Protection (MRP) provision to be \$1036/MSD. However, in order to be consistent with all numbers, we use the figures of \$342 and \$204 in all of the following calculations.

economic benefits.<sup>31</sup> The data from Table A-3 is summarized in Table 11 below.

**Table 11. Effect of a Potential Increase in MSDs and MRP Provisions on Costs and Benefits of the Rule**

	<b>PP&amp;E's Estimates</b>		<b>OSHA's Estimates</b>	
	Low-risk	High-risk	Low-risk	High -risk
<i>Cost of MRP provision</i>	<i>\$1,740</i>	<i>\$104,640</i>	<i>\$8,620</i>	<i>\$517,360</i>
All other costs	\$176,481	\$1,002,807	\$50,454	\$50,454
<b>Costs of the Rule</b>	<b>\$178,221</b>	<b>\$1,107,447</b>	<b>\$59,074</b>	<b>\$567,814</b>
<b>Benefits*</b>				
(Based on PP&E Estimates)	-0-	-0-	-0-	-0-
(Based on OSHA Estimates)	-0-	-0-	-0-	-0-

\* There are no benefits because there is a net increase in the number of MSDs due to much higher claims.

The overall objective of the Ergo program is to reduce the number of MSDs. The program may reduce injuries and suffering of workers. However, at the same time, the Ergo standard, as currently drafted with the MRP provisions, is likely to increase an employer's costs significantly. If the potential increase in MSD claims actually takes place, a reduction of at least 60% will have to be achieved in order to reduce the cost of the rule below the current costs of injuries and illnesses. A 60% reduction in MSDs would probably require large capital investments on the part of employers. The next two sections evaluate the costs and benefits facing different types of firms under the assumption that the number and characteristics of MSD claims do not change as a result of the rule, that is, the injured employees do not stay away from work any longer than they do today, and that those workers who do not stay away from work under the current rule will also not stay away from work under the proposed rule.

### **C. Costs and Benefits Facing A 249 Employee Low-Risk Firm**

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<sup>31</sup> One of the other effects of the proposed rule will be to induce employees to stay away from work longer than they presently do. An increase in the length of stay away from work will increase the costs proportionally. The effect of any such increase has not been taken into account in this report.

The low risk firm currently experiences one MSD every six years. It will begin to experience an MSD every 12 years after it has implemented the Ergo program. Currently it pays a certain amount as a workers' compensation premium. A person gets hurt every six years and the firm loses the services of the injured worker (for an average of 16 work days). Most worker's compensation insurance plans pay the injured worker most of his after-tax wages and medical costs. Hence, for the purpose of the following analysis, it is assumed that the MRP costs are equal to zero. This assumption will not be true in those cases in which the worker either loses a part of his benefits or is not covered by worker's compensation. OSHA estimates that, on a weighted average basis, a worker loses \$1,036/MSD. As shown in Table A-3, if an MSD occurs, this firm will have to spend \$44,898 in setting up the Basic program and \$176,480 dollars implementing the Full program for a total cost of \$221,378. If this firm is in the manufacturing sector, it will have to spend \$44,898 within the first year after the promulgation of the rule to set up the Basic program. It will then have to wait until the first MSD occurs, at which time, it will spend an additional \$176,480 to implement the Phase II programs. On average, the wait is likely to be six years from the date of the last injury.

Let us suppose that an MSD occurs today and the firm implements controls to reduce the MSD rate by 50%, that is, it postpones the occurrence of the next MSD to 12 years. This means that during the first period of 12 years, it eliminates one (1) MSD. Similarly, it will eliminate one MSD in each subsequent 12 year period. The value of one MSD, assuming PP&E's estimates of benefits, is \$2,916; therefore, the establishment will reduce its costs including worker compensation premiums and other costs by \$2,916 every 12 years, but it will have to pay an extra \$204 for lost wages and benefits. Thus, the net savings will be \$2,712 over 12 years or \$226/year. The net present value of these savings is \$2,260. This benefit, realized over a period of years, should be weighed against the cost of entire program.

If we assume that OSHA's estimate of the benefits is reasonable, the firm will save \$17,553 in workers' compensation premiums and other costs, but will have to pay an extra \$342 to compensate for lost wages and benefits over a period of 12 years. Thus, the yearly savings will be \$1,434 and the net present value of the savings would be \$14,340. This estimate should be weighed against the cost of the program as shown in Table A-4. The data from Table A-4 are summarized in Table 12 below.

**Table 12. Costs and Benefits Facing a Low-Risk Firm**

	<b>PP&amp;E's Cost Assumptions</b>	<b>OSHA's Cost Assumptions</b>
<b>Total Costs</b> of the Proposed Rule	<b>\$176,481</b>	<b>\$50,454</b>
<b>Benefits</b>		
(Based on PP&E's Estimates)	\$2,260	\$2,260
(Based on OSHA's Estimates)	\$14,340	\$14,340

The table above shows that whether PP&E's or OSHA's method is used to estimate the costs and benefits of the rule, the costs far exceed the benefits for low-risk firms. This data is relevant to the question of whether low-risk firms should be exempt from the requirements of the standard.

#### **D. Costs and Benefits Facing a 249 Employee High Risk Firm**

##### **1. Assuming All Injuries are Covered by Workers' Compensation**

Both the costs and the benefits in the case of the high-risk firm are expected to be much larger because it experiences a much greater number of MSDs (10) every year. Once again, if we assume that the firm will achieve a 50% reduction in MSDs, it will reduce its costs by \$14,580 per year (5 MSDs @ \$2916/MSD). However, the costs will increase by \$1020 (\$204/MSD) to compensate for lost wages and benefits. Thus, the net savings will be \$13,560 per year. These reductions will become permanent and the savings will take place for many years in the future. Assuming that the discount rate is 10% and that the savings are realized for all future years, the present value of the gains is \$135,600. This means that if the firm can spend less than \$135,600 to implement the Full program, it will realize a net gain.

However, as shown in Table A-3, a high-risk firm of this size can be expected to spend almost \$1.05 million to fully implement the program. The cost of the Basic program is \$44,898; therefore, given that the present value of future benefits is only \$135,600, the firm can spend up to \$90,702 (\$135,600 - \$44,898) on the Phase II program and still benefit from the program. Any costs above this amount will generate a negative cost-benefit ratio, unless productivity benefits can be realized. As shown in Table A-4, the cost of Hazard Control alone will be \$921,000, if we assume that the rate of capital expenditure is \$50,000 per 15 employees. Thus, if PP&E's

estimates of costs and benefits are used to evaluate the financial risks, the cost-benefit ratio may be negative for even the high risk firm to implement the Ergo program.

If OSHA's estimate of \$17,553/MSD is used to estimate the benefits, the firm will save \$87,765 per year (5 MSDs @ \$17,553/MSD). However, the firm will pay \$1710 (342 x5) to compensate for lost wages and benefits. Thus, the net gain will be \$86,055. The present value of these benefits, over an infinite time period, using a real discount rate of 10% is \$860,550. Since, the total costs of developing and implementing the program are only \$50,454 (Table A-4, Column 4), it will be economically beneficial for the firm to implement the Ergo program. However, it should be noted that this calculation assumes that this high-risk firm will spend only \$42,840 on Hazard Controls (this assumption may be questionable if it is a high-risk 249 employee firm). As the calculations in Table A-5 show, if this firm makes Hazard Control expenditures at a rate of \$40,000/15 employees, that is, if it makes total capital expenditures of \$755,107, its benefits from the program will be approximately equal to its costs. The cost and benefits facing this firm, therefore, are summarized in Table 13.

**Table 13. Costs and Benefits Facing a High -Risk Firm**

	<b>PP&amp;E's Cost Assumptions</b>		<b>OSHA's Cost Assumptions</b>
	Alt. I	Alt. II	
<b>Total Costs</b> <sup>32</sup>	<b>\$1,002,801</b>	<b>\$836,801</b>	<b>\$50,454</b>
<b>Benefits</b>			
(Based on PP&E's Estimates)	\$135,600	\$135,600	\$135,600
(Based on OSHA's Estimates)	\$860,550	\$860,550	\$860,550

This analysis suggests that the cost of the rule in some high-risk firms will exceed the benefits by a large margin.

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<sup>32</sup> As mentioned above, the analysis above assumes that the cost of the MRP provision are zero. The MRP costs may well exceed \$517,000 for this high-risk firm.

## **2. Assuming Injuries are Not Covered by Workers' Compensation**

In this case, it is assumed that potential MSDs are not covered by workers compensation. The firm will achieve a 50% reduction in MSDs, but its workers' compensation payments will not be reduced at all (because the MSD injuries are not covered). Instead the costs will increase by \$11,320 ( $\$2,264/\text{MSD} \times 5$ ) (see Table 11) per year to compensate for lost wages and benefits. Assuming that the discount rate is 10% and that the costs will increase for all future years, the present value of the costs is \$113,200. *This means that the firm will realize a net loss when implementing the Ergo program.*

### **E. Recommendations Based on Cost/Benefit Analysis**

The Cost Benefit analysis in this section suggests the following:

- The real cost of the MRP provision of the rule lies in its potential to increase MSD claims substantially. If this potential is realized, employees will benefit from reduced injuries and illnesses, but employers will experience a net increase in workers compensation premiums and related costs. This net increase does not take into account Hazard Controls costs, which may run into hundreds of thousands of dollars for some small businesses.
- If injuries suffered by workers are not covered by workers compensation, employers will experience a net increase in costs. The vast majority of the increase in cost will consist of the costs of hazard control and of the MRP provisions.
- Regardless of the method used to calculate costs and benefits of the program, the costs will exceed the benefits for low-risk firms. Therefore, consideration should be given to the following:
  - exempting all low-risk firms from the requirements of the rule by selecting a suitable exemption criterion. If it is assumed that only the low-risk firms are exempted, then this criterion may be equal to "at least two MSDs per year", that is, a firm must currently experience at least 2 MSDs per year, before it is required to implement the Full Program. On the other hand, if the criterion is



based on cost benefit analysis, a criterion of 6 MSDs per year may be adopted. This criterion is developed by assuming that the net benefit of reducing one MSD is \$17,122 per year, the cost of the program is only about \$50,454 (OSHA's rather minimal costs for a 249 employee firm) and an MSD reduction rate of 50% is achieved by implementing Hazard Controls.

- Exempting at least the low-risk firms (and preferably all firms in the manufacturing industry) from the Basic program requirements of the rule. Under the proposed rule, all firms in the manufacturing industry and all those with manual handling jobs will be required to implement the Basic program. The benefits of the rule do not exceed the costs of the Basic program under PP&E's assumptions for low-risk firms. Any high-risk firm should probably implement the Basic program immediately; however, because such a firm experience many MSDs per year, it should exceed the criterion for exemption from the rule shortly after the rule is promulgated. Therefore, it will have to implement both Phases I and II of the program at the same time. There is some economic benefit in implementing the two phases simultaneously; therefore, all firms should be exempted from the Basic program requirements until the exemption criterion is exceeded.
- The cost of Hazard Controls for some high-risk firms are likely to exceed potential benefits by large margins. In order to promote orderly and efficient compliance with the rule, OSHA should develop a scheme for "an economic variance" from the rule. OSHA should develop a financial test for granting an economic variance.

## V. CONCLUSION

This report suggests that OSHA's estimates of the costs in its Preliminary Initial Regulatory Flexibility Analysis of the draft proposed ergonomics standard, as furnished to the SBREFA Panel, may be significantly understated, and that OSHA's estimates of the benefits of the proposed standard may be significantly overstated. The understatement of costs is primarily due to the fact that OSHA's estimates of the hours required to implement each element of the proposed rule seem remarkably low. In addition, OSHA's estimates of capital expenditures on equipment to prevent MSDs do not account for varying establishment sizes, and seem quite low even for the smallest establishment size category. The overstatement of benefits can be attributed to the fact that OSHA has not accounted for a potentially dramatic increase in the number of MSDs resulting in days away from work as workers take advantage of the MRP provision. This increase in MSDs with days away from work also increases the costs of the rule. PP&E has provided alternative estimates of the costs and benefits of the proposed standard, and has attempted at all times to keep these estimates conservative. Nevertheless, PP&E estimates that the costs of the proposed standard could be anywhere from 2.5 to 15 times higher than those estimated by OSHA (see Tables A-1 and A-2). Furthermore, PP&E estimates that the MRP provision may increase the number of MSDs with days away from work to the point where there are no measurable benefits (at least, in an economic sense). Finally, this report shows that the cost to benefit ratio of this rule may be as much as ten times higher for small businesses than for large businesses.